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SPECIFICATION FOR TAPIOCA AS LIVESTOCK FEED

(First Revision)

Second Reprint MAY 1989

(Incorporating Amendment No. 1)

UDC 633.493:636.086.4

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 4 *February* 1973

IS : 1509 - 1972
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(First Revision)

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Indian Standard

SPECIFICATION FOR TAPIOCA AS LIVESTOCK FEED

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 12 October 1972, after the draft finalized by the Animal Feeds Sectional Committee had been approved by the Agricultural and Food Products Division Council.

0.2 Tapioca tubers (*Manihot utilissima* and *Manihot palmata*) are known to be used widely for feeding livestock in the states of Kerala and Tamil Nadu. The raw tubers, after being prepared by removing the outer skin are dried in the sun before use. The dried tubers for feeding livestock may be either in the form of chips or in the form of flour.

0.3 In 1959, two separate Indian Standards covering the requirements for tapioca chips (IS : 1509-1959) and flour (IS : 1510-1959) for animal feeding purposes had been issued. However, realising that the raw material for obtaining the aforesaid two forms of the material was the same it was decided to amalgamate these standards into one. In this revised version the requirements for tapioca chips and flour have been reviewed and revised. The characteristic for crude protein has been deleted and requirements for starch content included. In the case of tapioca flour requirement for alcoholic acidity has also been prescribed.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard prescribes the requirements and the methods of sampling and test for tapioca meant for livestock feeding.

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*Rules for rounding off numerical values (*revised*).

2. TYPES

2.1 Tapioca meant for livestock feeding shall be of the following two types:

Type I — Chips.
Type II — Flour.

3. REQUIREMENTS

3.1 General — The material shall be prepared from tubers of tapioca, and shall be free from dirt and extraneous matter, rancidity, adulterants, insect or fungus infestation and from musty, fermented or other objectionable odours.

3.1.1 *Type I* — Chips shall be dry and of thickness not exceeding 15 mm.

3.1.2 *Type II* — Tapioca floor shall be in the form of a coarse powder. This material, when tested by the method prescribed in Appendix A, not more than 5 percent by mass of the material shall be retained on 1·70-mm IS Sieve (aperture 1·70 mm) and not more than 10 percent by mass of the material shall pass through 1·00-mm IS Sieve (aperture 1·00 mm).

3.2 The material shall also conform to the requirements given in Table 1.

TABLE 1 REQUIREMENTS FOR TAPIOCA AS LIVESTOCK FEED

Sl No.	Characteristic	Requirements		Method of Test, Ref to	
		Type I Chips	Type II Flour	Appendix	Cl No. in IS : 4706-1968*
(1)	(2)	(3)	(4)	(5)	(6)
i)	Moisture, percent by mass, *Max*	13	13	B	—
ii)	Starch, percent by mass, *Min*	82	82	—	6
iii)	Total ash (on dry basis), percent by mass, *Max*	2·5	2·5	C	—
iv)	Acid insoluble ash (on dry basis), percent by mass, *Max*	1·0	1·0	D	—
v)	Crude fibre (on dry basis), percent by mass, *Max*	2·5	2·5	E	—
vi)	Hydrocyanic acid, percent by mass, *Max*	0·03	0·03	F	—
vii)	Alcoholic acidity (as H_2SO_4) in 90 percent alcohol, percent by mass, *Max*	—	0·15	G	—

*Methods of test for edible starches.

4. PACKING AND MARKING

4.1 Packing — Unless otherwise agreed between the purchaser and the vendor, the material shall be packed in clean and sound jute bags.

4.2 Marking — Each bag shall be suitably marked or labelled to give the following information:

a) Name and type of the material,
b) Name of the manufacturer,
c) Batch or code number, and
d) Net mass.

5. SAMPLING

5.1 Representative samples of the material shall be drawn as prescribed in Appendix H.

6. TESTS

6.1 Tests shall be carried out as prescribed in **3.1.2** and in col 5 and 6 of Table 1.

APPENDIX A

(*Clause* 3.1.2)

DETERMINATION OF PARTICLE SIZE OF TAPIOCA FLOUR

A-1. SIEVES

A-1.1 Make a nest of two sieves, the upper being 1·70-mm IS Sieve (aperture 1·700 mm) and the lower, 1·00-mm IS sieve (aperture 1·000 mm) with a cover on top of the upper sieve and a receiver below the lower sieve.

A-2. PROCEDURE

A-2.1 Weigh accurately about 100 g of the material into the upper sieve and fit it with the cover. Place the nest of the sieves with the receiver in a suitable mechanical sieve-shaker and shake at least for 5 minutes. At the end of this period, stop shaking, remove the nest of sieves and transfer the residue from the upper sieve and the receiver, separately, to two tared weighing dishes, using a brush and weigh each fraction accurately.

A-3. CALCULATION

A-3.1 Calculate the percentage of the material retained on 1·70-mm IS Sieve and passing through 1·00-mm IS Sieve as follows:

a) Material retained on 1·70-mm IS Sieve, percent by mass $= \frac{100\ M_1}{M}$

where

M_1 = mass in g of the material retained on 1·70-mm IS Sieve, and

M = mass in g of the material taken for the test.

b) Material passing through 1·00-mm IS Sieve, percent by mass $= \frac{100\ M_2}{M}$

where

M_2 = mass in g of the material obtained in the receiver, and

M = mass in g of the material taken for the test.

APPENDIX B

[*Table* 1, *Item* (i)]

DETERMINATION OF MOISTURE

B-1. PROCEDURE

B-1.1 Weigh accurately about 5 g of the material in a dish made of porcelain, silica or platinum, previously dried in an electric oven and weighed. Place the dish in an electric oven maintained at 100 ± 2°C for 5 hours. Cool the dish in a desiccator and weigh with the lid on. Heat the dish again in the electric oven for 30 minutes, cool and weigh. Repeat this process until the loss in mass between two successive weighings is less than one milligram. Record the lowest mass obtained.

NOTE — Preserve the dish containing this dried material for the determination of total ash (*see* **C-1.1**).

B-2. CALCULATION

B-2.1 Moisture, percent by mass $= \frac{100\ (M_1 - M_2)}{M_1 - M}$

where

M_1 = mass in g of the dish with the material before drying,

M_2 = the lowest mass in g of the dish with the material after drying,

M = mass in g of the empty dish.

APPENDIX C

[*Table* 1, *Item* (iii)]

DETERMINATION OF TOTAL ASH

C-1. PROCEDURE

C-1.1 Ignite the dried material in the dish (*see* **B-1.1**) with the flame of a Meker burner for about one hour. Complete the ignition by keeping in a muffle furnace at 600 ± 20°C until grey ash results. Cool in a desiccator and weigh. Ignite the dish again in the muffle furnace for 30 minutes, cool and weigh. Repeat this process until the difference in mass between two successive weighings is less than one milligram. Note the lowest mass.

NOTE — Preserve the dish containing this ash for the determination of acid insoluble ash (*see* **D-2.1**).

C-2. CALCULATION

C-2.1 Total ash (on dry basis), percent by mass $= \frac{100\,(M_2 - M)}{M_1 - M}$

where

M_2 = the lowest mass in g of the dish with the ash,

M = mass in g of the empty dish, and

M_1 = mass in g of the dish with the dried material taken for the test (*see* M_2 in **B-2.1**).

APPENDIX D

[*Table* 1, *Item* (iv)]

DETERMINATION OF ACID INSOLUBLE ASH

D-1. REAGENT

D-1.1 Dilute Hydrochloric Acid — approximately 5 N, prepared from concentrated hydrochloric acid (*see* IS : 265-1962*).

D-2. PROCEDURE

D-2.1 To the ash contained in the dish (*see* **C-1.1**), add 25 ml of dilute hydrochloric acid, cover with a watch-glass and heat on a water-bath for 10 minutes. Allow to cool and filter the contents of the dish through a

---

*Specification for hydrochloric acid (*revised*).

Whatman filter paper No. 42 or its equivalent. Wash the filter paper with water until the washings are free from the acid and return it to the dish. Keep it in an electric air oven maintained at 135 ± 2°C for about 3 hours. Ignite it in a muffle furnace at 600 ± 20°C for one hour. Cool the dish in a desiccator and weigh. Ignite the dish again in the muffle furnace for 30 minutes, cool and weigh. Repeat this process until the difference in mass between two successive weighings is less than one milligram. Note the lowest mass.

D-3. CALCULATION

D-3.1 Acid insoluble ash (on dry basis), percent by mass

$$= \frac{100\,(M_2 - M)}{M_1 - M}$$

where

M_2 = the lowest mass in g of the dish with the acid insoluble ash,

M = mass in g of the empty dish, and

M_1 = mass in g of the dish with the dried material (*see* M_2 in **B-2.1**):

APPENDIX E

[*Table* 1, *Item* (v)]

DETERMINATION OF CRUDE FIBRE

E-1. REAGENTS

E-1.1 Dilute Sulphuric Acid — 1·25 percent (*m/v*), accurately prepared.

E-1.2 Sodium Hydroxide Solution — 1·25 percent (*m/v*), accurately prepared.

E-2. PROCEDURE

E-2.1 Dry to constant mass, about 5 g of the material in an electric air-oven at 105 ± 1°C. Weigh accurately about 2·5 g of the dried material into a thimble and extract for about one hour with petroleum ether (boiling point 40 to 60°C) using a Soxhlet apparatus. Transfer the fat-free material to a 1-litre flask. Take 200 ml of dilute sulphuric acid in a beaker and bring to the boil. Transfer the whole of the boiling acid to the flask containing the fat-free material and immediately connect the flask with a reflux water condenser and heat so that the contents of the flask begin to boil within one minute. Rotate the flask frequently, taking care to keep the material from remaining on the sides of the flask out of contact with the acid. Continue boiling for exactly 30 minutes. Remove the flask and filter through fine linen (about 18 threads to a centimetre) held in a funnel, and wash with boiling water until the washings are no longer acid to litmus. Bring to the boil some quantity of the sodium hydroxide solution under a reflux condenser. Wash the residue on the linen into the flask with 200 ml of the boiling sodium hydroxide solution. Immediately connect the flask with the reflux condenser and boil for exactly 30 minutes. Remove the flask and immediately filter through the filtering cloth. Thoroughly wash the residue with boiling water and transfer to a Gooch crucible prepared with a thin but compact layer of ignited asbestos.

Wash the residue thoroughly first with hot water then with about 15 ml of 95 percent (*v*/*v*) ethyl alcohol. Dry the Goch ocrucible and contents at 105 ± 1°C in the air oven to constant mass. Cool and weigh. Incinerate the contents of the Gooch crucible at 600 ± 20°C in a muffle furnace until all the carbonaceous matter is burnt. Cool the Gooch crucible containing the ash in a desiccator and weigh.

E-3. CALCULATION

E-3.1 Crude fibre (on dry basis), percent by mass

$$= \frac{100\,(M_1 - M_2)}{M}$$

where

M_1 = mass in g of Gooch crucible and the contents before ashing,

M_2 = mass in g of Gooch crucible containing asbestos and ash, and

M = mass in g of the dried material taken for the test.

APPENDIX F

[*Table* 1, *Item* (vi)]

DETERMINATION OF HYDROCYANIC ACID

F-1. REAGENTS

F-1.1 Standards Silver Nitrate Solution — 0·02 N.

F-1.2 Standard Potassium Thiocyanate Solution — 0·02 N.

F-1.3 Ferric Alum Indicator Solution — prepared by boiling a saturated solution of ferric alum with a small amount of nitric acid until nitrous fumes have been expelled.

F-2. PROCEDURE

F-2.1 Weigh accurately about 10 g of the material and transfer it to a Kjeldahl flask of 800 ml capacity. Add about 100 ml of water and macerate for 2 hours. At the end of this period, add about 100 ml of water and distil with steam, collecting the distillate in a receiver containing a known quantity (about 20 ml) of the standard silver nitrate solution acidified with nitric acid. Care should be taken to see that the tip of the condenser dips below the surface of the standard silver nitrate solution in the receiver. When 150 ml or so has passed over, filter the distillate through a Gooch crucible. Wash the receiver and Gooch crucible with a small quantity of water and titrate the excess silver nitrate in the combined washings and filtrate with the standard potassium thiocyanate solution using about 5 ml of ferric alum indicator solution.

F-3. CALCULATION

F-3.1 Hydrocyanic acid, percent by mass

$$= \frac{2{\cdot}7\,(V_1N_1 - V_2N_2)}{M}$$

where

V_1 = volume in ml of the standard silver nitrate solution taken in the receiver of distillate,

N_1 = normality of the standard silver nitrate solution,

V_2 = volume in ml of the standard potassium thiocyanate solution required to titrate excess of the silver nitrate,

N_2 = normality of standard potassium thiocyanate solution, and

M = mass in g of the material taken for the test.

APPENDIX G

[*Table* 1, *Item* (vii)]

DETERMINATION OF ALCOHOLIC ACIDITY

G-1. REAGENTS

G-1.1 Neutral Ethyl Alcohol — 90 percent (*v/v*).

G-1.2 Alcoholic Sodium Hydroxide Solution — 0·02 N.

G-1.3 Curcuma Indicator Solution — one percent (m/v) in neutral ethyl alcohol.

G-2. PROCEDURE

G-2.1 Weigh accurately about 5 g of the material into a 100-ml conical flask provided with a ground — glass stopper and add 25 ml of neutral alcohol. Allow to digest for 24 hours with occasional shaking. Pipette 10 ml of the supernatant liquid into a conical flask and titrate with the standard alcoholic sodium hydroxide solution using curcuma indicator solution. The end point is indicated when the solution turns to chamois colour.

G-3. CALCULATION

G-3.1 Alcoholic acidity (as sulphuric acid) in 90 percent alcohol, percent by mass $= \dfrac{12{\cdot}25\,VN}{M}$

where

V = volume in ml of the standard alcoholic sodium hydroxide solution used in the titration,

N = normality of the standard sodium hydroxide solution, and

M = mass in g of the material taken for the test.

APPENDIX H

(*Clause* 5.1)

SAMPLING OF TAPIOCA CHIPS AND FLOUR AS LIVESTOCK FEED

H-1. GENERAL REQUIREMENTS OF SAMPLING

H-1.0 In drawing, preparing, storing and handling samples, the following precautions and directions shall be observed.

H-1.1 Samples shall be taken in a protected place not exposed to damp air, dust or soot.

H-1.2 The sampling instrument shall be clean and dry when used.

H-1.3 Precautions shall be taken to protect the samples, the material being sampled, the sampling instrument and the containers for samples from adventitious contamination.

H-1.4 The samples shall be placed in clean and dry glass containers. The sample containers shall be of such a size that they are almost completely filled by the sample.

H-1.5 Each container shall be sealed air-tight after filling and marked with full details of sampling, date of sampling, batch or code number, name of the manufacturer and other important particulars of the consignment.

H-1.6 Samples shall be stored in such a manner that the temperature of the material does not vary unduly from the normal temperature.

H-1.7 Sampling shall be done by a person agreed between the purchaser and the vendor and in the presence of the purchaser (or his representative) and the vendor (or his representative).

H-2. SCALE OF SAMPLING

H-2.1 Lot — All the containers in a single consignment of the material drawn from a single batch of manufacture or bearing the same code number shall constitute a lot. If a consignment is declared to consist of different batches of manufacture, the containers of the same batch or bearing the same code number shall be separated and shall constitute separate lots.

H-2.1.1 Samples shall be tested for each lot for ascertaining the conformity of the material to the requirements of this standard.

H-2.2 The number of containers to be selected from a lot shall depend on the size of the lot and shall be in accordance with Table 2.

TABLE 2 MINIMUM NUMBER OF CONTAINERS TO BE SELECTED FOR SAMPLING FROM VARIOUS SIZES OF LOTS

LOT SIZE (1)	NO. OF CONTAINERS TO BE SELECTED (2)
Up to 4	All Containers
5 to 20	5
21 ,, 125	6
126 ,, 250	7
251 ,, 500	8
501 ,, 800	9
above 800	10

H-2.2.1 These containers shall be chosen at random and for this purpose, random number table as given in Appendix B of IS : 4905-1968* shall be used. In case such a table is not available, the procedure described in **3.3** of IS : 4905-1968* shall be adopted.

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*Methods for random sampling.

H-3. TEST SAMPLES AND REFEREE SAMPLE

H-3.1 Preparation — Draw with an appropriate sampling instrument, equal quantities of material from different parts of each container selected (*see* Table 2). The total quantity of the material so obtained from the containers selected, shall be sufficient to conduct all tests given in **3** and shall be at least 0·75 kg. Thoroughly mix all portions of the material drawn from the selected containers and divide into three equal parts. Each portion so obtained shall constitute the test sample and shall be transferred immediately to thoroughly clean and dry containers and sealed air-tight. They shall be labelled with the particulars given in **H-1.5**.

H-3.2 Test Samples for Purchaser and Vendor — One test sample shall be sent to the purchaser and one to the vendor.

H-3.3 Referee Sample — The third test sample bearing the seals of the purchaser and the vendor shall constitute the referee sample to be used in case of dispute between the purchaser and the vendor. It shall be kept at a place agreed to between the two.

H-4. CRITERION FOR CONFORMITY

H-4.1 The lot shall be declared as conforming to this specification if the composite sample (*see* **H-3.1**) satisfy all the requirements as specified under **3**.

(*Continued from page* 2)

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AMENDMENT NO. 1 AUGUST 1996
TO
IS 1509 : 1972 SPECIFICATION FOR TAPIOCA AS LIVESTOCK FEED

(First Revision)

(*Page* 4, *Table* 1, *col* 6, *Heading*) — Substitute 'IS 4706(Part 2) : 1978*' *for* 'IS : 4706 - 1968*'.

[*Page* 4, *Table* 1, *Sl No.*(ii), *col* 6] — Substitute '9' *for* '6'.

(*Page* 4, *Table* 1, *foot-note with* '*' *mark*) — Substitute 'Methods of test for edible starches and starch products : Part 2 Chemical methods (*first revision*)' for the existing title.

(*Page* 7, *Appendix* D, *clause* **D-1.1**, *last line*) — Substitute 'IS 265 : 1993*' *for* 'IS : 265 - 1962*'

(*Page* 7, *foot-note with* ' * ' *mark*) — Substitute '(*fourth revision*)' *for* '(*revised*)'.

(FAD 5)

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